

# MINERAL RESOURCE POTENTIAL MAP OF THE CHATTAHOOCHEE ROADLESS AREA, TOWNS, UNION, AND WHITE COUNTIES, GEORGIA

By  
Arthur E. Nelson and Robert P. Koeppe, U.S. Geological Survey  
and  
Robert A. Welsh, Jr. and Ronald W. Mikolajczyk, U.S. Bureau of Mines  
1983

EXPLANATION OF MAP UNITS

Q

Unconformity

PzZrg

PzZrsq

PzZrs

PzZrra

Break in sequence

PzZt

Break in sequence

ZYgu

Break in sequence

Phu

Pha

Break in sequence

unc

Break in sequence

unc

AGE UNCERTAIN

QUATERNARY

LOWER PALEOZOIC AND (OR) PROTEROZOIC Z

PROTEROZOIC Z

PROTEROZOIC

AGE UNCERTAIN

DESCRIPTION OF MAP UNITS

Q

Quaternary deposits—Unconsolidated colluvium and alluvium. Coarse bouldry and cobbly gravels, sand, and clay. Colluvial materials cover many slopes and are thickest along lower slopes of steep valley walls; colluvium merges into alluvial fan deposits; streams commonly choked with bouldery debris. Alluvial deposits are fine-textured gravels and sand, present in all stream valleys; thickest deposits are present in broader stream valleys.

PzZrg

Chiefly biotite gneiss variably interlayered with and gradational into metasediment, alternates with thin to thick layers of biotite schist, muscovite-biotite schist, hornblende gneiss and amphibolite, calc-silicate layers, minor gabbroic dioritic, and granite gneiss—biotite gneiss, medium-gray to brownish-gray, medium-to coarse-grained, locally porphyroblastic, irregularly layered to massive, principally contains biotite, feldspar, and garnet, with lesser amounts of muscovite, epidote, sphene, and sulfides. Commonly light-felsic and dark-biotite segregations form major parts of exposures. Pegmatites and granite pods and veins common.

PzZrs

Mostly metasediment variably interlayered with and gradational into biotite gneiss, interlayered with biotite schist, muscovite-biotite schist, hornblende gneiss, and amphibolite—metasediment, felsic, and quartzite with quartz and feldspar dominant to argillaceous, light-green to brownish-gray, fine- to medium-grained, locally contains pebble layers, thinly to thickly layered, containing garnet, plagioclase, biotite, quartz, with minor epidote, sphene and sulfides. Locally metasediment has numerous very thin quartz-feldspathic segregations alternating with very thin dark biotite streaks. Discontinuous pegmatite and quartz veins and pods are common.

PzZrsq

Feldspathic quartz-rich metasediment, light-gray, fine-grained, and thinly layered, is closely associated with light-tan to light-gray quartzite. Locally rich in epidote and some muscovite.

PzZrs

Biotite schist and muscovite-biotite schist interlayered with metasediment, biotite gneiss, and some granite gneiss—biotite schist, gray to dark-brown, medium- to coarse-grained, irregularly layered to massive, containing biotite, feldspar, quartz, sillimanite, and locally abundant garnet, in places muscovite nearly equal to biotite, sericite clusters present, locally has some chlorite and graphite; calc-silicate layers, felsic segregations, granite and pegmatite veins and pods are all common.

PzZrra

Amphibolite—Dark-greenish-gray to black, fine- to medium-grained amphibolite thinly laminated and locally with thin black mafic and light felsic stripes; contains mostly plagioclase and actinolite or hornblende, with some garnet, biotite, epidote, chlorite, and quartz. Locally grades into hornblende gneiss and in places associated with metagabbro.

PzZt

Alternating sequence of migmatitic impure metasediment and graywacke, biotite gneiss, biotite schist, and amphibolite of the Tallulah Falls Formation, includes some granitic gneiss.

ZYgu

Undivided Proterozoic Z rocks of Great Smoky thrust sheet exposed in window through Hayesville thrust sheet—Rocks believed to be part of Ocoee Supergroup, they consist of alternating beds of metasediment and mica schist; includes some bodies of granite gneiss. Mica schist, thinly to thickly layered, containing garnet, feldspar, biotite and a lesser amount of muscovite, locally some chlorite, and sulfides present, quartz-feldspathic segregations common, sillimanite present in more aluminous layers. Metasediment, medium- to dark-gray, fine- to medium-grained, thinly to thickly bedded, contains feldspar, muscovite, biotite, and quartz, locally abundant garnet and epidote. Some granite and quartz-feldspathic lenses present especially in more schistose units; some calc-silicate layers, lenses and pods also present.

EXPLANATION

Zn = 1000 ppm

Sn = 200-300 ppm

Sn = 300 ppm

Zn = 1000 ppm

Be = 100-200 ppm

Contact—Approximately located; dashed where concealed

Thrust fault—Approximately located; sawtooth on upper plate. Dashed where concealed; queried where probable

Strike and dip of layering and foliation

Strike and dip of foliation

Inclined

Vertical

Horizontal foliation

Strike and dip of cleavage

Inclined

Bearing and plunge of lineation

Minor synform showing plunge of axis

Minor antiform showing plunge of axis

Minor fold showing plunge of axis

Quarry, abandoned

Sand and gravel pit, abandoned

Approximate boundary of roadless area

Prospect

Mine

Mine, abandoned

Studies Related to Wilderness

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal Lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral resource survey of the Chattahoochee Roadless Area (08-022), National Forest, Towns, Union, and White Counties, Georgia. The area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1978.

SUMMARY

The Chattahoochee Roadless Area has a low mineral resource potential and there is little evidence of a potential for the presence of concealed mineral resources. The resource potential for gold, mica, sillimanite, soapstone, dunite, chromite, and nickel is low, even though some of these commodities have previously been mined nearby and source rocks for these minerals are present in the study area. Granite gneiss, schist, and quartzite in the area are suitable for crushed rock or aggregate. However, other sources of these materials are available closer to present markets. The potential for hydrocarbons in the area is untested.

INTRODUCTION

The Chattahoochee Roadless Area occupies approximately 36 sq mi in the Chattahoochee National Forest of north Georgia. It is located about 12 mi southeast of Blairsville, Ga., and occupies parts of three counties: the northeastern part is in Towns County, the southern half is in White County, and the northwest part is in Union County (fig. 1). It lies in heavily forested terrane and has a rugged topography characterized by narrow valleys, sharp ridges, and steep slopes. Slopes commonly range from 20 to 30° and in places exceed 45°; rarely are they less than 10°. The highest elevation is 4,045 ft on Horseshoe Mountain, and the lowest is 1,660 ft in Horton Creek, west of Helen in the southern part of the area. Tributaries of the north-flowing Hiwassee River, the south-flowing Chattahoochee River, and the northwest-flowing Nottley River drain the Chattahoochee Roadless Area.

State routes 17, 66, 180, and the scenic Richard Russell Highway (348) lead to roads and trails that give limited access to the interior of the study area. In addition, the Appalachian Trail traverses part of the study area's high ground.

## SURFACE- AND MINERAL-RIGHTS OWNERSHIP

U.S. Forest Service records indicate that the Federal Government owns surface rights to more than 99 percent of the Chattahoochee Roadless Area. Mineral rights in the study area are 71 percent Federally owned and 29 percent privately owned (fig. 2). Privately owned mineral rights are held in perpetuity, and most are in third party ownership. Amoco Production Company leased 144 acres in the study area for oil and gas exploration, effective through July 1, 1982, and lease applications for an additional 4,300 acres have been submitted to the Bureau of Land Management for approval (fig. 3).

## GEOLOGY

Metamorphic rocks of two major thrust sheets form this part of the Blue Ridge Mountains in the southern Appalachians (Nelson, 1982). These are the Hayesville thrust sheet and the Great Smoky thrust sheet. They are separated by the southeast-dipping Hayesville fault (Rankin, 1975; Hatcher, 1978), a major Appalachian tectonic feature (Williams, 1978). The exposed rocks in the study area are part of the Hayesville thrust sheet, but rocks of the Great Smoky thrust sheet underlie the Hayesville thrust sheet in the area.

## Hayesville thrust sheet rocks

Several major metamorphic rock assemblages make up the Hayesville thrust sheet. These include the Tallulah Falls Formation of probable late Proterozoic and/or early Paleozoic age (Hatcher, 1971; Bell and Luce, 1983), which occupies most of the eastern part, and the Richard Russell Formation (R. D. Hatcher, Jr., oral commun.). Most of the Chattahoochee Roadless Area is underlain by rocks that correlate with the Richard Russell rocks. This rock assemblage includes biotite gneiss, biotite schist, fine-grained biotite-feldspar gneiss, metasediment, amphibolite, hornblende gneiss, granite gneiss, and discontinuous pegmatite and veins of varying thickness. These rocks are highly migmatitic and contain many irregular granitic masses. Sillimanite, while widely distributed, is generally in rocks with a low muscovite content. All the rocks are polydeformed.

## Ultramafic-mafic rocks

A wide variety of ultramafic-mafic rocks are present in the Hayesville thrust sheet as small discontinuous pods, as well as some large mappable units (Hadley and Nelson, 1971). These rocks are chiefly serpentinite, dunite, pyroxenite, gabbro, and amphibolite (Hartley, 1973). Locally, some of these rocks are magnetite rich. Ultramafic rocks are present near the northwest border of the study area along the northeast-trending Hayesville fault, which separates the Hayesville thrust sheet from underlying rocks of the Great Smoky Group. Ultramafic rocks are also exposed along strike northeast of the roadless area, and most probably they are present locally below the Hayesville thrust sheet elsewhere in the area.

## Helen belt rocks

Although rocks of the Helen belt do not underlie the Chattahoochee area, they are exposed less than 330 ft from the southeast border of the study area. Rocks in the belt include metagraywacke, quartzite, graphite-bearing garnet-muscovite-biotite schist, and biotite-feldspar metasediment. The metasediment is locally conglomeratic and inter-layered with thin beds of muscovite schist. Thin to thick layers of amphibolite are also present.

## GEOCHEMICAL SURVEY

A reconnaissance geochemical survey was undertaken to determine if any unidentified mineral deposits exist within the Chattahoochee Roadless Area (Koeppe and Nelson, in press). Samples of bedrock, stream sediments, and alluvial panned concentrates were analyzed by the 31-element, emission-spectrographic method. Most of the samples contain normal element abundances and distribution. Non-magnetic fractions of several panned concentrates from streams along the southern edge of the area have moderate enrichments of zinc (1000 ppm) and tin (200-300 ppm), but no other evidence was found for concentration of metals in the study area. The tin is probably in the form of cassiterite, since it is only in the non-magnetic fraction. The nature of the occurrence is not known, but it seems likely that these anomalous abundances of tin and zinc represent only small localized concentrations and are not indicative of a hidden mineral deposit. Non-magnetic fractions from two other stream concentrates taken along the south edge of the area have beryllium abundances of 100-200 ppm. The source of the anomalous beryllium is not known; it may be related to mineral concentrations of accessory minerals derived from Helen Belt rocks which partially underlie these drainage basins, or possibly to mineralization associated with fluid migration along the Shope Fork fault during one or more thermal event.

## MINERAL RESOURCE POTENTIAL

An evaluation of the mineral resource potential was only made for rocks of the Hayesville thrust sheet; the mineral resources potential for the deeply buried rocks of the Great Smoky thrust sheet is beyond the scope of this study.

Rocks for use as construction material and for landscaping form a potential resource. However, no metallic resources are known in the Chattahoochee Roadless Area, and no evidence of any significant deposit was found in the geochemical survey (Koeppe and Nelson, in press) or in the geophysical survey (Daniels, 1983). Although gold, mica, asbestos, and olivine have been mined nearby, there is a low potential for the occurrence of these commodities in the study area. The potential for oil and gas from deeply buried rocks under the Hayesville and other regional thrust sheets is untested.

## Construction materials

Much of the rock underlying the study area is suitable for use as crushed rock, aggregate, or landscaping. One small quarry in biotite gneiss is located at the northeast corner of the area. Because there are good sources of aggregate and crushed stone closer to major markets, there is no immediate use for rock in the study area as a source for construction materials.

## Gold

There is no recorded gold mining in the Chattahoochee Roadless Area, but in the Nacoochee district 1 mi to the southeast, gold has been intermittently mined for the last 150 years (Koschmann and Bergendahl, 1968). The fact that all known local gold mining has been confined to rocks of the Helen belt suggests that the gold deposits are geologically controlled by factors unique to the Helen belt, although a few small deposits are known in areas underlain by the Hayesville thrust sheet more than ten miles to the northeast (Nelson and others, 1983). Hurst and Ottwell (1964) found minor amounts of gold particles in concentrated alluvial samples from Jansu and Low Gap Creeks, near the eastern boundary of the study area. However, these authors remark that the use of gold-bearing gravels as road metal in the local area makes interpretation of gold anomalies uncertain. Analyses of sluiced and panned concentrates collected from the same streams during the present field reconnaissance revealed no gold (Koeppe and Nelson, in press; Welsh and Mikolajczyk, 1982). The only gold found during this study was one particle in a panned concentrate of sediments from the Left Fork of the Nottley River (Welsh and Mikolajczyk, 1982, p. 15). This gold occurrence is not considered to be indicative of a potential resource.

## Other mineral commodities

Minerals associated with the mafic-ultramafic rocks in the region include asbestos, soapstone, corundum, olivine, the metallic accessory mineral chromite, and minerals that contain nickel and platinum. Slugs of mafic-ultramafic rocks underlying the northwestern corner of the study area indicate the presence of impure soapstone and dunite, both of negligible value. Chromite and nickel contents of these sampled rocks are well below minable concentrations and platinum was not detected. No asbestos or corundum was found.

Pegmatites that crop out in the study area are small, unzoned pods consisting of biotite and muscovite mica, quartz, and feldspar. The muscovite mica is of poor quality and has negligible value. The sillimanite and kyanite contents of sampled metamorphic rocks of the Hayesville thrust sheet are too low to constitute a refractory or aluminum source. Several panned concentrates of stream gravels are slightly enriched in tin, but there is no other evidence that significant concentrations of tin are present in the study area.

## Hydrocarbons

Recent data from COCORP seismic reflection surveys suggest that lower Paleozoic sedimentary strata underlie the Blue Ridge Precambrian rocks (Cook and others, 1979). Projections of seismic data into the study area shows that a thickness of nearly 5 mi of crystalline rocks overlies this sedimentary sequence (Cook and others, 1979). Sedimentary rocks that contain hydrocarbons in the Tennessee Valley may form a part of the sedimentary sequence underlying the regional thrust sheets in the study area. Hatcher (1982) discussed the hydrocarbon potential of these buried sediments, and concluded that hydrocarbon stability is unlikely beneath much of the Blue Ridge because of the probable high temperatures present at depth. If hydrocarbons are present, they would probably be in the form of gas, and deep drilling is necessary to prove the presence of gas before reliable estimates of the gas potential can be made.

## References

Bell, Henry, III, and Luce, R. W., in press, Geologic map of the Ellicott rock Wilderness and additions, South Carolina, North Carolina, and Georgia; U.S. Geological Survey Miscellaneous Field Studies Map MF-1287-B.

Cook, F. A., Albaugh, D. S., Brown, L. D., Kaufman, Sidney, Oliver, J. E., and Hatcher, R. D., Jr., 1979, Thin-skinned tectonics in the crystalline southern Appalachians: COCORP seismic-reflection profiling of the Blue Ridge and Piedmont: *Geology*, v. 7, no. 12, p. 563-567.

Daniels, D. L., in press, Aeromagnetic map and analysis of aeromagnetic and aeroradiometric data in the Blood Mountain, Chattahoochee, and Tray Mountain Roadless Areas, northern Georgia: U.S. Geological Survey Miscellaneous Field Studies Map MF-1347-E, scale 1:62,500.

Gillon, K. A., 1982, Stratigraphic, structural, and metamorphic geology of portions of the Cowrock and Helen Georgia 7.5' quadrangles: unpublished M.S. thesis, University of Georgia, Athens, Georgia, 236 p.

Hadley, J. B., and Nelson, A. E., 1971, Geologic map of the Knoxville quadrangle, North Carolina, Tennessee, and South Carolina: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-654, scale 1:250,000.

Hartley, M. E., III, 1973, Ultramafic and related rocks in the vicinity of Lake Chatugee: *Georgia Geological Survey Bulletin* 85, 61 p.

Hatcher, R. D., Jr., 1971, The geology of Rabun and Habersham Counties, Georgia: *Georgia Geological Survey Bulletin* 83, 48 p.

1978, Structural style of the Blue Ridge: *Geological Society of America Penrose Research Conference Field Trip*, May 12-13, 1978, 17 p.

1982, Hydrocarbon resources of the Eastern Overthrust Belt: *Science*, v. 216, p. 980-982.

Hurst, V. J., and Ottwell, W. L., 1964, Exploration for mineral deposits in White County: Washington, D.C., U.S. Department of Commerce, ARA Contract no. Cc-5960, 166 p.

Koeppe, R. P., and Nelson, A. E., in press, Geochemical survey of the Chattahoochee Roadless Area, Town, Union, and White Counties, Georgia: U.S. Geological Survey Miscellaneous Field Studies Map MF-1502-C.

Koschmann, A. H., and Bergendahl, M. H., 1968, Principal gold-producing districts of the United States: U.S. Geological Survey Professional Paper 610, 283 p.

Lynch, V. J., 1953, Letter listing tungsten localities in Georgia: Unpublished data on file in Pittsburgh, Pa. at Eastern Field Operations Center, U.S. Bureau of Mines, 2 p.

Mertie, J. B., Jr., 1979, Monazite in the granitic rocks of the southeastern Atlantic states - an example of the use of heavy minerals in geologic exploration: U.S. Geological Survey Professional Paper 1084, 79 p.

Nelson, A. E., 1982, Geologic map of the Tray Mountain Roadless Area, northern Georgia: U.S. Geological Survey Miscellaneous Field Studies Map MF-1347-A, scale 1:50,000.

Nelson, A. E., Koeppe, R. P., and Chatman, M. L., in press, Mineral resource potential of the Tray Mountain Roadless Area, northern Georgia: U.S. Geological Survey Miscellaneous Field Studies Map MF-1347-C.

Rankin, D. W., 1975, The continental margin of eastern North America in the southern Appalachians; the opening and closing of the Proto-Atlantic Ocean: *American Journal of Science, Tectonics and Mountain Ranges*, v. 275-A, p. 298-326.

Welsh, R. A., Jr., and Mikolajczyk, R. W., 1982, Mineral investigation of Chattahoochee River RARE II Further Planning Area, Town, Union, and White Counties, Georgia: U.S. Bureau of Mines Open-File Report MIA 140-82, 25 p.

Williams, Harold, 1978, Tectonic lithofacies map of the Appalachian Orogen: St. John's Memorial University of Newfoundland, scale 1:1,000,000.

Yeates, W. C., McCallie, S. W., and King, F. P., 1986, A preliminary report on a part of the gold deposits in Georgia: *Georgia Geological Survey Bulletin* 4-A, 542 p.

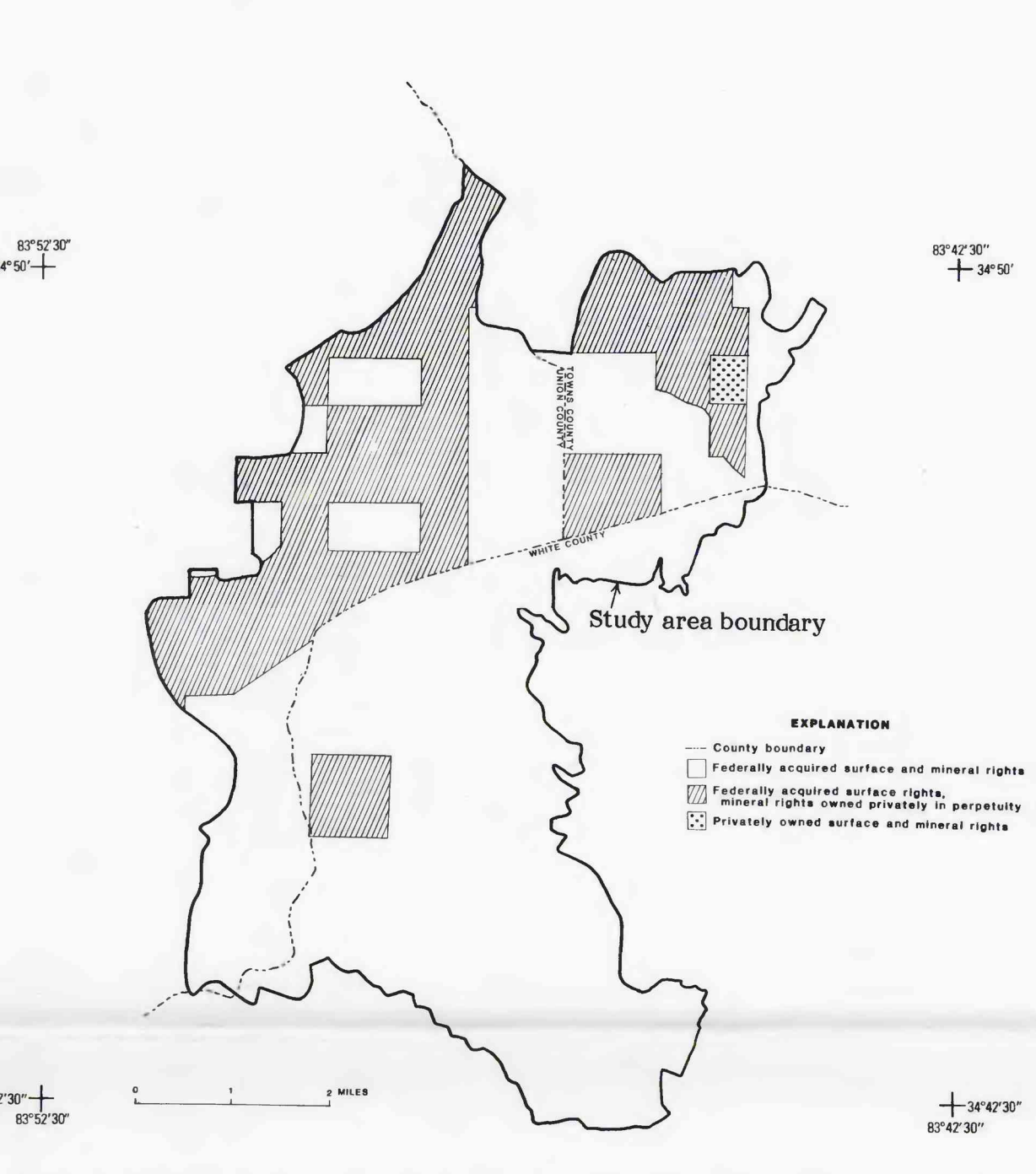


Figure 2.—Surface- and mineral-rights ownership, Chattahoochee Roadless Area, Ga.

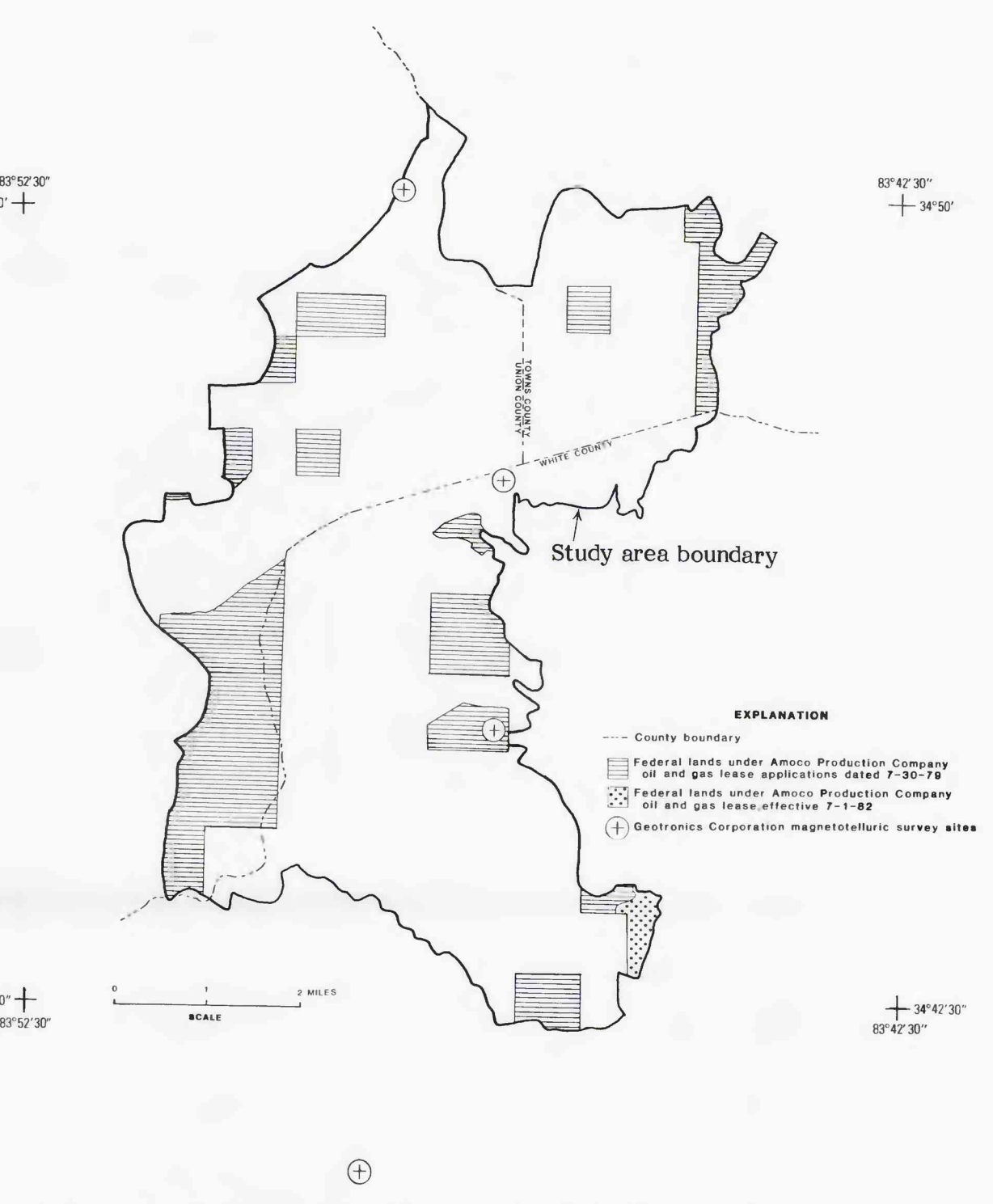


Figure 3.—Oil and gas leasing and exploration, Chattahoochee Roadless Area, Ga.

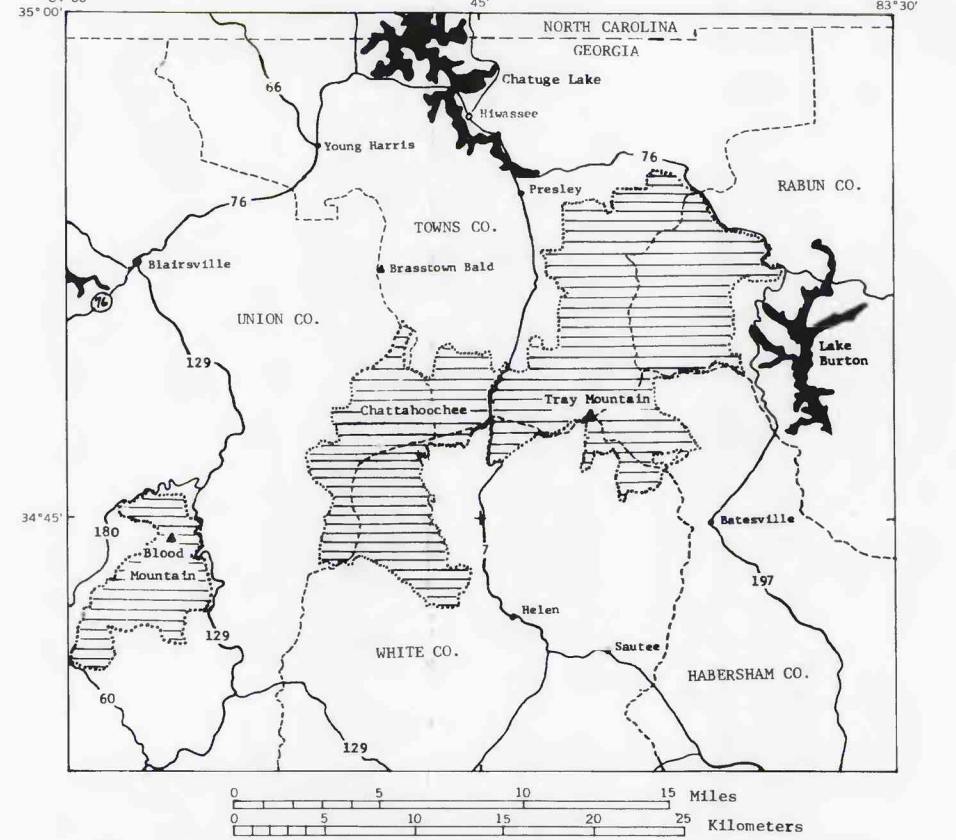


Figure 1.—Index map showing location of Chattahoochee, Tray Mountain, and Blood Mountain Roadless Areas (ruled areas).